WHAT IS CLAIMED IS:

1. An engaging force control device of a lockup clutch for use with a torque converter for a vehicle, the lockup clutch engaging a pump impeller connected to the engine with a turbine runner connected to an input shaft of an automatic transmission according to an engaging force, comprising:

a sensor which detects an engine rotation speed (*EngREV*);

a sensor which detects an input rotation speed (*PriREV*) of the automatic transmission;

an engaging force regulating mechanism which regulates the engaging force of the lockup clutch; and

a programmable controller programmed to:

calculate a relative rotation speed (ω_{SLPR}) of the pump impeller and the turbine runner from the engine rotation speed (*EngREV*) and the input rotation speed (*PriREV*) of the automatic transmission;

compare an initial engine rotation speed (*ST_EREV*) which corresponds to an engine rotation speed when control of the engaging force is started, with a predetermined target engine rotation speed (*TGT_EREV*);

set a target relative rotation speed (ω_{SLPT}), when the initial engine rotation speed (*ST_EREV*) is equal to or greater than the predetermined target engine rotation speed (*TGT_EREV*), according to a difference between the target engine rotation speed (*TGT_EREV*) and the input rotation speed (*PriREV*) of the automatic transmission;

set the target relative rotation speed (ω_{SLPT}), when the initial engine rotation speed (*ST_EREV*) is smaller than the predetermined target engine

rotation speed (*TGT_EREV*), to gradually vary from an initial relative rotation speed (*ST_EREV*) which corresponds to the relative rotation speed (ω_{SLPR}) of the pump impeller and the turbine runner when control of the engaging force is started, to a predetermined target change-over relative rotation speed (*CHG_SREV*); and

control the engaging force regulating mechanism such that the relative rotation speed (ω_{SLPR}) coincides with the target relative rotation speed (ω_{SLPT}).

2. The engaging force control device as defined in Claim 1, wherein the controller is further programmed to set the predetermined target change-over relative rotation speed (*CHG_SREV*) to equal a fixed relative rotation speed (*CHG_SREV_SET*) when the initial relative rotation speed (*ST_SREV*) is equal to or greater than the fixed relative rotation speed (*CHG_SREV_SET*), and to set the predetermined target change-over relative rotation speed (*CHG_SREV*) to equal the initial relative rotation speed (*ST_SREV*) when the initial relative rotation speed (*ST_SREV*) is smaller than the fixed relative rotation speed (*CHG_SREV_SET*).

3. The engaging force control device as defined in Claim 1, wherein the controller is further programmed to calculate a target input rotation speed (*CHG_PREV*) by subtracting the target change-over relative rotation speed (*CHG_SREV*) from the target engine rotation speed (*TGT_EREV*), compare the input rotation speed (*PreREV*) with the target input rotation speed (*CHG_PREV*), and set the target relative rotation speed (ω_{SLPT}) to equal a difference between the target engine rotation speed (*TGT_EREV*) and the input rotation speed (*PriREV*) when the input rotation speed (*PriREV*) is equal to or greater than the target input rotation speed (*CHG_PREV*).

4. The engaging force control device as defined in Claim 1, wherein the controller is further programmed to set a time constant initial value (*ST_TC*), when the initial engine rotation speed (*ST_EREV*) is greater than the target engine rotation speed (*TGT_EREV*), to a larger value than a time constant initial value (*ST_TC*) that is set when the initial engine rotation speed (*ST_EREV*) is smaller than the target engine rotation speed (*TGT_EREV*), set a time constant (*Tc*) to a value which decreases from the time constant initial value (*ST_TC*) as time elapses from when the control of the engaging force is started, calculate a target relative rotation speed correction value (ω_{SLPTC}) by applying a first-order delay processing to the target relative rotation speed (ω_{SLPT}) under the time constant (*Tc*), and control the engaging force regulating mechanism to cause the relative rotation speed (ω_{SLPR}) to coincide with the target relative rotation speed correction value (ω_{SLPTC}).

5. The engaging force control device as defined in Claim 1, wherein the controller is further programmed to set the time constant initial value (*ST_TC*) to equal a predetermined maximum value (*ST_TC_MAX*) when the initial engine rotation speed (*ST_EREV*) is equal to or greater than a sum of the target engine rotation speed (*TGT_EREV*) and a predetermined maximum deviation (*EngERR*), set the time constant initial value (*ST_TC*) to equal a predetermined minimum value (*ST_TC_MIN*) when the initial engine rotation speed (*ST_EREV*) is smaller than the target engine rotation speed (*TGT_EREV*), and set the time constant initial value (*ST_TC*) to a value between the predetermined maximum value (*ST_TC_MAX*) and the predetermined minimum value (*ST_TC_MIN*) according to a difference between the engine rotation speed (*EngREV*) and the target engine rotation speed (*EGT_EREV*)

when the initial engine rotation speed (*ST_EREV*) is equal to or greater than the target engine rotation speed (*TGT_EREV*) and smaller than the sum of the target engine rotation speed (*TGT_EREV*) and the predetermined maximum deviation (*EngERR*).

6. The engaging force control device as defined in Claim 1, wherein the engaging force control device further comprises a throttle sensor which detects an throttle opening of the engine, and the controller is further programmed to set the target engine rotation speed (*TGT_EREV*) to increase as the throttle opening (*TVO*) increases.

7. The engaging force control device as defined in Claim 1, wherein the automatic transmission is arranged to upshift at a predetermined first speed (*VSP1*), the engaging force control device further comprises a throttle sensor which detects an throttle opening (*TVO*) of the engine and a vehicle speed sensor which detects a vehicle speed (*VSP*), and the controller is further programmed to set the target relative rotation speed (ω_{SLPT}) according to the throttle opening (*TVO*) when the vehicle speed (*VSP*) is greater than the predetermined first speed (*VSP1*).

8. The engaging force control device as defined in Claim 7, wherein the controller is further programmed to set the target relative rotation speed (ω_{SLPT}) to zero revolutions per minute, when the vehicle speed (*VSP*) is larger than a predetermined second speed (*VSP2*) which is larger than the predetermined first speed (*VSP1*).

9. An engaging force control device of a lockup clutch for use with a torque converter for a vehicle, the lockup clutch engaging a pump impeller connected to

the engine with a turbine runner connected to an input shaft of an automatic transmission according to an engaging force, comprising:

means for determining an engine rotation speed (*EngREV*);

means for determining an input rotation speed (*PriREV*) of the automatic transmission;

means for regulating the engaging force of the lockup clutch;

means for calculating a relative rotation speed (ω_{SLPR}) of the pump impeller and the turbine runner from the engine rotation speed (*EngREV*) and the input rotation speed (*PriREV*) of the automatic transmission;

means for comparing an initial engine rotation speed (*ST_EREV*) which corresponds to an engine rotation speed when control of the engaging force is started, with a predetermined target engine rotation speed (*TGT_EREV*);

means for setting a target relative rotation speed (ω_{SLPT}), when the initial engine rotation speed (*ST_EREV*) is equal to or greater than the predetermined target engine rotation speed (*TGT_EREV*), according to a difference between the target engine rotation speed (*TGT_EREV*) and the input rotation speed (*PriREV*) of the automatic transmission;

means for setting the target relative rotation speed (ω_{SLPT}), when the initial engine rotation speed (*ST_EREV*) is smaller than the predetermined target engine rotation speed (*TGT_EREV*), to gradually vary from an initial relative rotation speed (*ST_EREV*) which corresponds to the relative rotation speed (ω_{SLPR}) of the pump impeller and the turbine runner when control of the engaging force is started, to a predetermined target change-over relative rotation speed (*CHG_SREV*); and

means for controlling the engaging force regulating means such that the

relative rotation speed (ω_{SLPR}) coincides with the target relative rotation speed (ω_{SLPT}).

10. An engaging force control method of a lockup clutch for use with a torque converter for a vehicle, the lockup clutch engaging a pump impeller connected to the engine with a turbine runner connected to an input shaft of an automatic transmission according to an engaging force regulated by an engaging force regulating mechanism, the method comprising:

determining an engine rotation speed (*EngREV*);

determining an input rotation speed (*PriREV*) of the automatic transmission;

calculating a relative rotation speed (ω_{SLPR}) of the pump impeller and the turbine runner from the engine rotation speed (*EngREV*) and the input rotation speed (*PriREV*) of the automatic transmission;

comparing an initial engine rotation speed (*ST_EREV*) which corresponds to an engine rotation speed when control of the engaging force is started, with a predetermined target engine rotation speed (*TGT_EREV*);

setting a target relative rotation speed (ω_{SLPT}), when the initial engine rotation speed (*ST_EREV*) is equal to or greater than the predetermined target engine rotation speed (*TGT_EREV*), according to a difference between the target engine rotation speed (*TGT_EREV*) and the input rotation speed (*PriREV*) of the automatic transmission;

setting the target relative rotation speed (ω_{SLPT}), when the initial engine rotation speed (*ST_EREV*) is smaller than the predetermined target engine rotation speed (*TGT_EREV*), to gradually vary from an initial relative rotation speed (*ST_EREV*) which corresponds to the relative rotation speed (ω_{SLPR}) of the pump impeller and

the turbine runner when control of the engaging force is started, to a predetermined target change-over relative rotation speed (*CHG_SREV*); and

controlling the engaging force regulating mechanism such that the relative rotation speed (ω_{SLPR}) coincides with the target relative rotation speed (ω_{SLPT}).